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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/691,794	10/23/2003	Ke Liu	C-2990Hys	7156
7590 12/21/2004			EXAMINER	
M. P. Williams 210 Main Street Manchester, CT 06040			NGUYEN, TU MINH	
			ART UNIT	PAPER NUMBER
			3748	

DATE MAILED: 12/21/2004

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary

Application No.

10/691,794

Applicant(s)

LIU ET AL.

Examiner

Tu M. Nguyen

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-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☐ Responsive to communication(s) filed on 13 December 2004.
- 2a) ☒ This action is **FINAL**. 2b) ☐ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) ☒ Claim(s) 1-4 is/are pending in the application.
- 4a) Of the above claim(s) _____ is/are withdrawn from consideration.
- 5) ☐ Claim(s) _____ is/are allowed.
- 6) ☒ Claim(s) 1-4 is/are rejected.
- 7) ☐ Claim(s) _____ is/are objected to.
- 8) ☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☒ The drawing(s) filed on 23 October 2003 is/are: a) ☒ accepted or b) ☐ objected to by the Examiner.
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

- 12) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☐ All b) ☐ Some * c) ☐ None of:
- ☐ Certified copies of the priority documents have been received.
 - ☐ Certified copies of the priority documents have been received in Application No. _____.
 - ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

- | | |
|--|---|
| 1) <input type="checkbox"/> Notice of References Cited (PTO-892) | 4) <input type="checkbox"/> Interview Summary (PTO-413)
Paper No(s)/Mail Date. _____ |
| 2) <input type="checkbox"/> Notice of Draftsperson's Patent Drawing Review (PTO-948) | 5) <input type="checkbox"/> Notice of Informal Patent Application (PTO-152) |
| 3) <input type="checkbox"/> Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08)
Paper No(s)/Mail Date _____ | 6) <input type="checkbox"/> Other: _____ |

DETAILED ACTION

1. An Applicant's Amendment filed on December 13, 2004 has been entered. Claims 1-3 have been amended. Overall, claims 1-4 are pending in this application.

Claim Rejections - 35 USC § 102

2. The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office Action:

A person shall be entitled to a patent unless –

(e) the invention was described in (1) an application for patent, published under section 122(b), by another filed in the United States before the invention by the applicant for patent or (2) a patent granted on an application for patent by another filed in the United States before the invention by the applicant for patent, except that an international application filed under the treaty defined in section 351(a) shall have the effects for purposes of this subsection of an application filed in the United States only if the international application designated the United States and was published under Article 21(2) of such treaty in the English language.

3. Claim 1 is rejected under 35 U.S.C. 102(e) as being anticipated by Kirwan et al. (U.S. Patent 6,655,130).

As shown in Figure 1, Kirwan et al., in an internal combustion engine system (20) which operates on fuel and which has an auxiliary system (24) which intermittently uses an internally generated mixture including hydrogen and carbon monoxide ("syngas", hereinafter), disclose a method comprising:

- generating in a reformer (12) at least an amount of syngas adequate for the auxiliary system;

- repetitively, during operation of the engine, periodically applying the syngas to the auxiliary system (24) in the adequate amount during first periods of time interspersed with second periods of time (during accelerated exhaust catalyst (24) heating, syngas is applied to the catalyst for a period of time (lines 19-24 and lines 42-45 of column 5)); and

- during the second periods of time, reducing the amount of the syngas generated so as to generate no more than a small fraction of the adequate amount of syngas (during higher loads, syngas is supplied at smaller amounts to the engine (lines 37-42 of column 5)).

Claim Rejections - 35 USC § 103

4. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office Action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

5. Claims 2-3 are rejected under 35 U.S.C. 103(a) as being unpatentable over Bloomberg et al. (U.S. Patent 6,560,958) in view of Kirwan et al.

Re claims 2 and 3, as shown in Figure 5, Bromberg et al. disclose a method and an apparatus for generating a mixture including hydrogen and carbon monoxide (lines 63-64 of column 1) ("syngas", hereinafter), the apparatus comprising:

- an oxides-of-nitrogen ("NOx" hereinafter) trap assembly (32) having an adsorption material which is periodically regenerated with syngas;

- an internal combustion engine system (26) which operates on fuel and provides exhaust having NO_x therein to the NO_x trap assembly;
- first means (12) for generating syngas from the exhaust and the fuel in an amount effective to regenerate the adsorption material in the NO_x trap assembly;
- second means (valve means not numbered but clearly shown) for periodically applying at least the effective amount of the syngas to the NO_x trap assembly for first periods of time (regeneration of NO_x trap) on the order of 5-10 seconds long (lines 56-62 of column 3), interspersed with second periods of time (non-regeneration of NO_x trap); and
- third means (a controller not shown but obviously must have) for altering the operation of either the first means or the second means during the second periods by diverting the syngas from the NO_x trap assembly to an inlet of the engine (lines 45-52 of column 4).

Bromberg et al., however, fail to disclose that the second periods of time are about 8-20 times longer than the first periods of time; and that during the second periods of time, an amount of fuel and exhaust gas used to regenerate the syngas is reduced so as to generate no more than a small fraction of the effective amount of syngas.

Bromberg et al. disclose the claimed invention except for specifying an optimum range of non-regeneration time of NO_x trap of about 8-20 times longer than a regeneration time of NO_x trap. It would have been obvious to one having ordinary skill in the art at the time the invention was made to provide specific optimum ranges of non-regeneration time of NO_x trap, since it has been held that where the general conditions of a claim are disclosed in the prior art, discovering

the optimum or workable ranges involves only routine skill in the art. *In re Aller*, 105 USPQ 233.

As shown in Figure 1, Kirwan et al. teach a system to supply a syngas (18a, 18b) to a catalyst (24) and to an engine (20), in which the syngas is supplied to the catalyst during a first period of time (accelerated catalyst heating). During a second period of time (higher engine loads), the engine is run with a blend of gasoline and syngas so as to maintain desired engine torque requirement (lines 40-43 of column 5). As indicated on lines 38-40, Kirwan et al. further teach that syngas displaces air to the engine and thus decreases maximum engine power. Therefore, as the engine load becomes higher, an amount of syngas supplied to the engine in Kirwan et al. is reduced. It would have been obvious to one having ordinary skill in the art at the time of the invention was made, to have utilized the teaching by Kirwan et al. in the method and apparatus of Bromberg et al., since the use thereof would have been routinely practiced by those with ordinary skill in the art.

6. Claim 4 is rejected under 35 U.S.C. 103(a) as being unpatentable over Bromberg et al. in view of Kirwan et al. as applied to claim 3 above, in view of official notice.

The apparatus of Bromberg et al. discloses the invention as cited above, however, fails to disclose that the adsorption material in the NO_x trap assembly comprises barium carbonate.

It is well known to those with ordinary skill in the art that a typical NO_x trap contains at least a metal such as barium in the alkali or alkaline earth metal groups as an NO_x adsorption material. Therefore, such disclosure by Bromberg et al. is notoriously well known in the art so as to be proper for official notice.

Response to Arguments

7. Applicant's arguments with respect to the references applied in the previous Office Action have been fully considered but they are not persuasive.

In response to applicant's argument that Kirwan et al. only supply syngas to the catalyst at start-up and thus fail to disclose a) "repetitively, during operation of the engine, periodically applying the syngas to the auxiliary system in the adequate amount during first periods of time interspersed with second periods of time"; and b) "during the second periods of time, reducing the amount of the syngas generated so as to generate no more than a small fraction of the adequate amount of syngas" (page 5 of Applicant's Amendment), the examiner respectfully disagrees.

Re item a), as indicated on lines 5-9 in the Abstract, Kirwan et al. state that "*The supply of air, reformat, and liquid fuel to the engine and exhaust catalyst is metered so as to provide low hydrocarbon and NOx emissions over a range of operating conditions from cold-start and idle through vehicle road-loads*" (emphasis added). This sentence discloses that the syngas in Kirwan et al. is supplied in at least three operating conditions of the vehicle: cold start, idling (during a stop at a traffic light, for example), and various engine loads during vehicle moving along a road. Thus, Kirwan et al. clearly disclose the step of "repetitively, during operation of the engine, periodically applying the syngas to the auxiliary system in the adequate amount during first periods of time interspersed with second periods of time".

Re item b), on lines 16-19 of the Abstract, Kirwan et al. further state that "*In another embodiment, the present system provides ultra-low NOx emissions at light and mid loads using*

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extreme dilution and partial reformat fueling". And on lines 39-42 of column 5, Kirwan et al. disclose that "*at higher engine loads, the present control system blends gasoline 14b with reformat 18a to meet engine torque requirements while maintaining very lean engine operation*". Thus, during road-loads conditions (second periods of time), a fuel intake in the engine of Kirwan et al. contains a mixture of gasoline and syngas. Therefore, Kirwan et al. again clearly disclose the step of "reducing the amount of the syngas generated so as to generate no more than a small fraction of the adequate amount of syngas during the second periods of time".

Conclusion

8. **THIS ACTION IS MADE FINAL.** Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a).

A shortened statutory period for reply to this final action is set to expire THREE MONTHS from the mailing date of this action. In the event a first reply is filed within TWO MONTHS of the mailing date of this final action and the advisory action is not mailed until after the end of the THREE-MONTH shortened statutory period, then the shortened statutory period will expire on the date the advisory action is mailed, and any extension fee pursuant to 37 CFR 1.136(a) will be calculated from the mailing date of the advisory action. In no event, however, will the statutory period for reply expire later than SIX MONTHS from the mailing date of this final action.

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Communication

9. Any inquiry concerning this communication or earlier communications from the examiner should be directed to Examiner Tu Nguyen whose telephone number is (571) 272-4862.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Mr. Thomas E. Denion, can be reached on (571) 272-4859. The fax phone number for the organization where this application or proceeding is assigned is (703) 872-9306.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).

Tu M. Nguyen

TMN

December 17, 2004

Tu M. Nguyen

Patent Examiner

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